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RESEARCH ARTICLE / ARAŞTIRMA MAKALESİ

Spatial econometric analysis of health services in Turkey through the perspective of the health development indicator

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Abstract

Health-related parameters are critical as indicators of development, and as a result, governments allocate a sizable portion of their budgets to the health sector. The most fundamental variable considered an indicator of health development is the infant mortality rate, which was used as the dependent variable in this study. The data utilized in the study were compiled from the TURKSTAT web page and the TR Ministry of Health's health annuals, with the year 2019 serving as the reference point for access to all data. In the study, econometric analyses were performed while keeping the notion of contiguity in mind to reveal the factors healthily affecting the infant mortality rate at the NUTS 3 level, which encompasses all provinces in the TURKSTAT regional categorization. The distribution of infant mortality rates by provinces in Turkey was analyzed in this context, and it was discovered that there was a high degree of clustering between provinces. This clustering structure indicated the presence of a spatial relationship between provinces, and it was from this point of view that spatial econometric analysis of health services in Turkey was conducted. Analyzes were carried out using STATA and GeoDa package programs.

The diagnostic tests revealed the presence of spatial autocorrelation, necessitating the employment of the spatial autoregressive model (SAR Model) to explain the relationship between the variables. As a result, it was concluded that both the variables included in the study and the infant mortality rate in nearby locations have an effect on the infant mortality rate for each province.

Keywords: Health economics, spatial health econometrics, health development, ınfant mortality, spatial autoregressive model

JEL codes: I15, C31, C12

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1. INTRODUCTION

In the constitution of the World Health Organization, health is defined as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO Constitution 07.04.1948). Numerous health-related parameters are utilized as development indicators in international statistics. Health parameters, which are used to categorize countries on a global scale, necessitate investment and development in this field. The quality of health care is influenced by various factors, including education, economic conditions, and environmental conditions, and is shaped by these factors.

The most important indicator of health development and public health determinants is the infant mortality rate. The infant mortality rate is defined as the number of deaths per 1000 live births in the same year (Turkish Statistical Institute, 2019). It is known that this indicator explains the causes of infant mortality and other factors that may affect the health status of the entire population, such as economic development, living conditions, social welfare, disease rates, and quality of life (Gider and Guzel, 2018: 1659). The infant mortality rate is commonly used to compare the progress of the social health level of countries over time, the status of various regions within countries, and the change within these regions through time, as well as to compare countries in terms of health levels (Hamzaoğlu, 2017: 288). Factors such as advancements in the field of health, innovative treatment and follow-up procedures, the provision of health services, and access to these services all contribute to the increase and decrease in infant mortality rates. A high rate indicates the presence of unfavourable socio-economic indicators, such as insufficient preventative health care, a low level of education, unequal distribution of income, environmental pollution, and noise (Barlas et al., 2014).

The crude birth rate is one of the most fundamental variables associated with infant mortality. The crude birth rate refers to the number of live births per thousand inhabitants (Turkish Statistical Institute, 2020). When both econometric studies that contain this variable and studies in the field of direct public health are evaluated, it becomes clear that when the crude birth rate and total fertility rate increase, all mortality rates increase as well (Demirtas and Metintas, 2017:21).

In Turkey, health care delivery is organized in a three-stage system. Primary health care services include preventative health care for the environment and society as a whole and outpatient diagnosis and treatment provided by family health centres. Secondary health care services are a top-tier health care institution where outpatient and inpatient treatment services are provided by hospitals. Tertiary health services include a wide range of health care providers, including private branch hospitals, educational hospitals, and university hospitals (Akman and Tarim, 2020:305). Among these, primary health care, health promotion, preventive health services, diagnosis, treatment, and rehabilitation are all provided in a coordinated manner; individuals can easily access the service, and the service is effective and widely available at a low cost. (Aloglu and Tasliyan, 2016:4). It improves access to all preventive services, such as pregnancy monitoring in primary care, offering pregnant and infant immunization services and proper training, early detection of mortality risk, and reducing the incidence of adverse outcomes (Kurt at al., 2019:176). From this vantage point, it is vital for every pregnant woman to have access to high-quality care and to track whether they benefit from services provided to pregnant women in the field to reduce infant deaths.

Following pregnancy detection, it should be determined in advance where each pregnant woman will be monitored, where she will deliver, and where pregnant women in need of emergency obstetric care will be directed. At this point, data on hospital beds and newborn intensive care units, as well as statistics on the number of nurses and midwives, take on greater significance (Kalanlar, 2018:505). According to the World Health Organization (WHO), midwives are approved when admitted into an official midwifery training program in their country of residence, successfully complete the prescribed training program, and obtain the required professional credentials. Midwives are responsible for providing required care and counselling during pregnancy, labour, and delivery, perform normal delivery and provide newborn care and family planning counselling (ICM, 2017).

On the other hand, the literacy rate in the final model of the research refers to the ratio of individuals with literacy authority in the society to the entire population. There are many studies in the literature that suggest that literacy is associated with socioeconomic variables. Although the link between infant mortality and literacy is positive in the econometric literature, a negative relationship has been observed in the domain of spatial econometrics. This situation emerges as a result of the provinces' sociocultural structure, which exhibits a strong spatial econometric correlation between their locations.

The variables in this study were analyzed with spatial econometric techniques, which incorporated the effect of location as a parameter in the model. With the location effect included in the model, these variables are no longer evaluated in terms of all provinces as they are in classical econometric models but rather in terms of provinces with a substantial spatial association.

2. LITERATURE

In their study, Manavgat and Celik (2017) analyzed the possible determinants of health level with spatial panel data method, taking into account the externality of health services in the 2008-2014 period and at the level of 81 provinces. The analysis determined that the adoption of a spatial delayed fixed effects panel model was reasonable, and the model's findings established the existence of a positive spatial effect on health levels between provinces. It has been determined that income level and social health insurance are significant determinants of health level, and that factors such as education level, urbanization rate, and ease of access to health services improve health level. The analysis revealed no statistically significant relationship between the technology levels of the provinces, the incentives for the health sector and the level of health.

Yetim at al. (2021) aimed to determine the socio-economic causes of infant mortality in Turkey in their study. In this context, statistics from 2014 to 2018 at the Nuts-2 level were used. The data were analyzed using the panel regression approach. It was found that as the percentage of university degree women increases, the infant mortality rate decreases, and as fertility increases, the infant mortality rate increases.

In their study, Der and Yesilyurt (2020) estimated the social and economic factors affecting infant mortality with the panel fixed-effects model. Firstly, a panel data set covering the years 2009-2018 on infant mortality at the provincial level was investigated. According to the findings, infant mortality increases as the illiterate female population and contrary to expectations, per capita income increases. For the 2014-2018 period, factors that lacked data at the province level were tested at the Nuts-2 region level. As income inequality increases, infant mortality increases; conversely, as the number of university-educated women and, again, contrary to predictions, the unemployment rate increase, infant mortality decreases. Finally, the reasons for the differences between countries in infant mortality were investigated for the 2011-2017 period and 56 developed and developing countries, and it was observed that infant mortality decreased as per capita national income, female population with at least primary school degrees, and the proportion of the population with access to electricity increased.

While there are numerous studies in the Turkish literature that investigate health-related indicators using various econometric and statistical methods, studies that investigate the factors directly affecting infant mortality rates in a spatial econometric framework are rather limited. The spatial econometrics literature in Turkey has improved significantly over the last decade, although it has not yet achieved the desired level. When it comes to health studies, econometric studies utilizing panel data sets are more prevalent. This study differs from its counterparts in that it employs cross-sectional data and contributes to the literature by investigating health-related indicators through spatial models.

3. RESEARCH

3.1. The Purpose of the Research

This research aims to investigate the health system in Turkey along the axis of the Infant Mortality Rate variable, which is an indicator of health development. For this purpose, initially, the total number of enterprises, total exports, number of automobiles, etc. variables were taken as welfare indicators in the provinces, as indicators of social structure; literacy rate, GDP per capita, rural population ratio, etc. variables were taken, as health indicators; the total number of physicians, the total number of hospitals, the number of applications to primary health care services, the total number of midwives, etc. variables were taken. The correlation matrix was used to investigate the relationships between these variables and the dependent variable; inappropriate variables were eliminated from the study, and the variables that would be employed were given their final shape.

In order to establish the variables to be used in the research, a correlation matrix was generated using the STATA program. All spatial analyzes were performed with the GeoDa Package program.

3.2. Research Methodology

Recently, spatial data models are frequently preferred in studies on health economics. With the assumption that the state of neighbouring locations has an effect on health-related indicators, spatial econometric techniques were preferred in this study. The difference between spatial econometric techniques and classical econometric techniques is that they consider the location effect resulting from the location of the data set (Anselin, 1988a:8). The location effect is incorporated into the models via a weight matrix acquired through several methods. If the units to be reviewed are to be investigated according to their relationship structure, socioeconomic weighting techniques may be selected; if they are to be investigated according to their geographical location, a matrix based on coherence may be preferred. In this study, one of the geographical weighting techniques, weighting based on coherence, was preferred. The term "contiguity-based weighting" refers to the process of establishing a link between spatial units depending on their location on a distinguishable map. (Gumprecht, 2007:6).

The need for weighting techniques has arisen due to the existence of spatial effects. The effects observed in the data set can be classified into two categories: spatial autocorrelation, which can be defined as the dependence between observations in the section data set, and spatial heterogeneity, which can be defined as the dependence between errors in the section data set. More precisely, spatial dependence emerges when the value of a variable at a certain location is determined not just by internal conditions but also by the value of the same variable at neighbouring locations (Frexedas and Vaya, 2005:154). Spatial heterogeneity refers to the fact that the functional form and parameters vary according to the data set's locations and are not homogeneous. In contrast to spatial dependence, problems emerging from spatial heterogeneity are solved using classical econometric techniques (Anselin, 1988a:9).

The matrix exhibiting the relationship structure necessary for determining the relevant effects is a positive matrix with dimensions W, NxN. This matrix has a binary value, with w_{ij}=1 indicating that the locations i and j are adjacent and w_{ij}=0 indicating that they are not. Diagonal elements of the matrix are w_{ij}=0 (Anselin et al., 2008:627). In practice, the transformed form of this matrix is frequently used to facilitate the calculation of spatial variables and their interpretation. The most common transformation is row standardization, and the row standardized neighbourhood matrix is called the spatial weight matrix (Viton, 2010:5).

When developing spatial econometric models, the standard approach begins with a non-spatial linear regression model and then assesses if the model should be extended to include spatial effects. This approach is known as the specific-to-general approach (Elhorst, 2010:11). All models in the literature are presented in Figure 1.

The spatial autoregressive model (Fischer and Wang, 2011:33) or another saying spatial lag model (Elhorst, 2010:13), one of the most frequently used models in practice (SAR model) describes the spatial correlation in the dependent variable. This model specification is based on theoretical reasoning, such as emphasizing the neighbourhood effect or spatial externality that exists across spatial units and is evident in the dependent variable. In this way, a meaningful interpretation of the spatial autocorrelation can be made (Fischer and Wang, 2011:32).

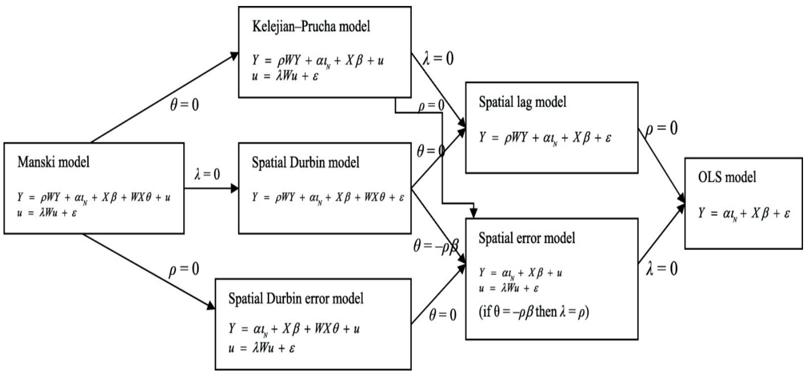
However, the spatial error model (SEM model) describes the spatial dependence in the error term. Spatial error dependence may occur as unobserved latent variables are spatially correlated. In addition, this dependency can also arise if the variables collected for analysis do not accurately reflect the neighbourhood structure. Such a spatial autocorrelation structure is considered unrealistic (Fischer and Wang, 2011:33).

Although these two models are the most frequently used in practice, the other spatial models in Figure 1 are used in the general-to-specific approach, where constraints are applied to the Manski model, and the OLS model is approached, or in the specific-to-general approach, where diagnostic tests are used to determine the presence of effects in the OLS model and the Manski model is approached.

3.3. Findings of the Research

Figure 2 illustrates a map of the infant mortality rate's spatial distribution by province. This map provides a priori information on whether the data have a spatial effect or not. The spatial distribution map enables us to determine whether the infant mortality rate distribution is random or not, in other words, the variable's spatial dependence on provinces.

Figure 1. Cross-Section Spatial Regression Models



Source: Elhorst, 2010: 13

Figure 2. Spatial Distribution Map of Infant Mortality Rate

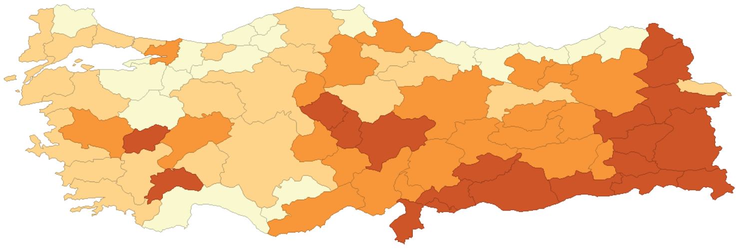
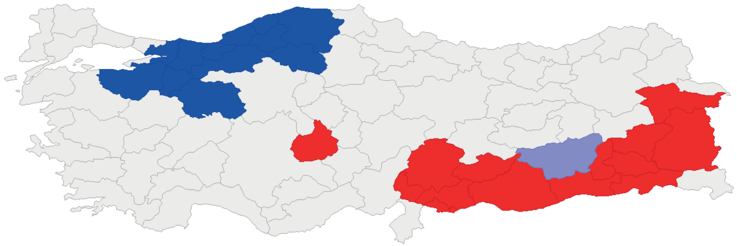


Figure 3. LISA Map of Infant Mortality Rate



When the spatial distribution map of the infant mortality rate is examined, it is clear that the data distribution is not random but rather follows a systematic pattern between provinces. The dark-coloured units indicate the provinces with the highest infant mortality rates.

The distribution map shows the distribution of all data between the relevant locations. The LISA statistics stated previously can be used to determine whether this distribution is significant in certain regions and not in others. In this context, the LISA map obtained for the migration variable is as follows:

There is no significant location-based correlation between the uncoloured provinces and infant mortality rates on the LISA map. The red areas indicate provinces that are the first region in the Moran I scatter plot and fall within the area with a high-high correlation, indicating spatial clustering. The high-high correlation indicates that while the infant mortality rate is high in these regions, it is also high in their neighbours. The blue areas indicate provinces, the third region in the Moran I scatter plot, suggesting spatial clustering and falling into the area where the correlation is observed low-low. The low-low relationship indicates that while the emigration in these regions is low, it is also low in their neighbours. The dark blue areas indicate the provinces, which are the second region in the Moran I scatter plot and fall within the region where the relationship is observed to be low-high, indicating the extreme spatial value. The low-high correlation indicates that while the infant mortality rate is low in these regions, it is high in their neighbours.

Considering all this information, the summary of significant correlations in the LISA map is as follows:

Correlations between 27 provinces were found to be statistically significant in total. When the provinces with a significant correlation are examined, a significant distribution is observed, particularly along the northwest-southeast line. While this visual tool allows for a preliminary inference about the existence of the relationship, it is necessary to confirm the existence of the relationship with diagnostic tools, if available. For this purpose, Moran I scatter plot is examined first.

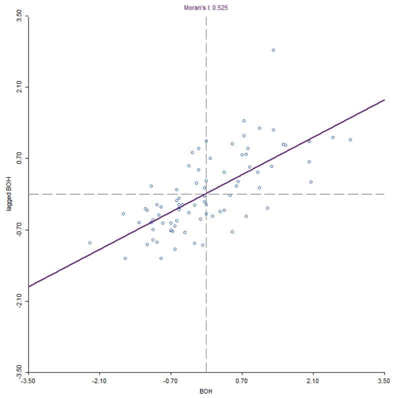
The Moran I scatter plot is a diagnostic tool used to geometrically show the structure of the spatial relationship with the help of Moran I statistics. In this graph, the slope of the regression accuracy gives Moran I statistics. If observations fall into zone 2 and 4, Moran I is negative, the spatial end value is involved, and spatial heterogeneity is mentioned. If the observations fall into zone 1 and 3, Moran I will be positive, there is

Table 1. LISA Map Summary Table

High - High	Low - Low	Low - High
Osmaniye, Kilis, Gaziantep, Adıyaman, Şanlıurfa, Mardin, Aksaray, Kahramanmaraş, Ağrı Batman, Şırnak, Siirt, Bitlis, Van	Diyarbakır	Eskisehir, Bolu, Düzce, Kocaeli, Sakarya, Bilecik, Çankırı, Kastamonu, Bursa, Zonguldak, Karabuk, Bartın,

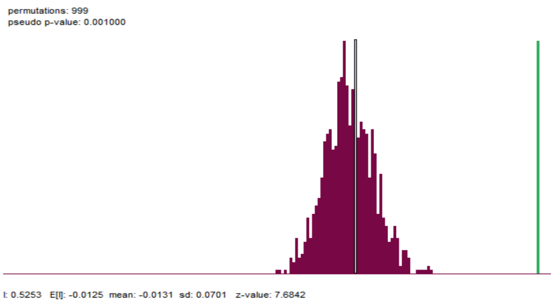
spatial clustering. If the distribution of observations is random, Moran I is zero.

Figure 4. Moran I Scatter Plot



In this study, the Moran I statistical value was obtained as 0.525. The distribution of values within regions 1 and 4 and the positive Moran I statistics indicate geometrically that the dependant variable exhibits a preconditionally significant positive spatial autocorrect. However, a significance test should be performed for the final result. The significance of the Moran I statistic can be examined as follows:

Figure 5. Significance Test of Moran I Statistics



At the bottom of the figure above, Moran I statistic is 0.5253, expected value E(I)=-0.0125, average -0.0131, and z statistic 7.6842, respectively. When the hypotheses;

H_0: There is no spatial autocorrelation

H_A: There is spatial autocorrelation

are established to test the spatial autocorrelation are tested at the 5% significance level, theH_0 hypotheses is rejected since the pseudo p value<α is 0.001<0.05, in other words, the spatial autocorrelation in question. The value of Moran I statistics is investigated to determine the direction of autocorrelation. In the analysis, this value was obtained as 0.5253. A positive value indicates the presence of a positive autocorrelation. Therefore, infant mortality rate between provinces has a positive spatial structure.

3.3.1. Ordinary Least Square Forecast Results

Diagnostic tests to determine the spatial model that accurately reflects the relationship structure are based on LS residues. For this reason, firstly, the classical LS model was forecasted:

The crude birth rate, the number of primary care applicants, the number of midwives, and the literacy rate were all identified as significant variables as a result of Least Square forecast.

3.3.2. Diagnostic Test Results

In order to determine the effect of the observed spatial structure, diagnostic tests were conducted using the residuals of the model. The test results of the application are summarized in the table below:

Among the tests used to decide on the appropriate dependence structure, LMρ spatial autocorrelation

Table 2. Ordinary Least Square Prediction

Variable	Coefficient	Probability
Constant	4.42660	0.01485
LNCBR	0.80888	0.00000
LNPCA	-0.30635	0.00721
LNMWV	-0.31302	0.00512
LNLIT	2.80035	0.04977
R-squared :	0.796861	
Adjusted R-squared :	0.770380	
Prob(F-statistic) :	0.000000	

Table 3. Diagnostic Test Results

Test	Coefficient	Probability
Moran I*(error)*	2.6050	0.00919
$LM_{\rho\lambda}$	4.4837	0.10626
LM_{ρ}	4.4716	0.03446
Robust LM_{ρ}	0.6442	0.42219
LM_{λ}	3.8395	0.05006
Robust LM_{λ}	0.0121	0.91251

(SAR Model Test), LM_{λ} spatial heterogeneity (SEM Model Test), and the most general form of these two tests, $LM_{\rho\lambda}$ (SAC Model Test) is used to test whether both dependence coexist. First of all, the test expressed with $LM_{\rho\lambda}$ and hypotheses shown in the figure below is applied.

H_0: $\rho = \lambda = 0$

H_A:$\rho \neq \lambda \neq 0$

According to the test results, the H_0 hypothesis is accepted at the 95% confidence level. In other words, it is not appropriate to use the model that includes both effects at the same time. In this case, the effects should be tested individually. The hypotheses of the test expressed by LMρ, which tests spatial autocorrelation, are expressed as follows.

H_0: $\rho = 0$

H_A: $\rho \neq 0$

When the LMρ results are examined, it is concluded that the classical regression assumption with a 5% margin of error is not valid; therefore, that there is a spatial autoregression effect. The hypotheses of the test expressed by the LM_{λ} test for spatial heterogeneity are shown as follows.

H_0: $\lambda = 0$

H_A: $\lambda \neq 0$

When the LM_{λ} results are examined at the 95 % confidence level, it is determined that the classical regression assumption is valid and that no spatial heterogeneity exists. Robust statistics do not need to be evaluated since one of the effects is significant and the other is not. In light of these findings, it is clear that spatial heterogeneity does not exist in the presence of spatial autocorrelation.

3.3.3. SAR Model

When the diagnostic test results with LS residues are analyzed, it is determined that the SAR Model is the most appropriate spatial model (Spatial Autoregressive Model). From spatial econometric neighbourhood definitions, the spatial weight matrix were created based on rook neighbourhood and used when establishing the model in accordance with SAR model specification. The forecasted SAR model is as follows:

When the model results are examined in the table 4, it is seen that all variables are statistically significant at the 95% confidence level. The coefficient of determination (R^2)is 0.83. It is observed that the ρ, which is the indicator of spatial dependence, is also significant at the 95% confidence level. The fact that the spatial regression term ρ is positive indicates that the infant mortality rate trend in one area will be similar to the trend in its neighbours. As a result, all of these variables, as well as the infant mortality rate in neighbouring provinces, have an effect on the infant mortality rate in each province.

There are the positive relationship between the crude birth rate (CBR) and infant mortality rate (IMR) in provinces. Studies in the literature seem to support this result.

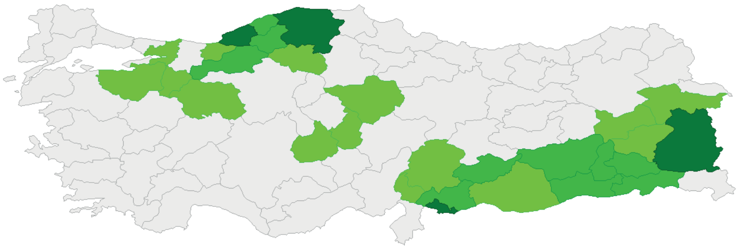
When the relationship between the number of primary care applicants (PCA) and infant mortality rate is examined in terms of provinces, it appears that there is an inverse relationship between these two variables. As mentioned previously, the content of primary health services is critical for a healthy pregnancy and its aftermath. When considered in this context and sample studies from the literature are analyzed, the findings are consistent with expectations.

As an important result for the development of health, a negative relationship has also been found between the number of midwives (MWV) in the provinces and the infant mortality rate. When job descriptions and competencies of midwives are considered, midwives play critical functions such as monitoring the pregnancy process and assisting pregnant women who require special care. Again, when the literature is reviewed, it is discovered that there is a relationship between the infant mortality rate and the midwife number variables.

Table 4. SAR Model Results

Variable	Coefficient	Probability
W_IMR(ρ)	0.29833	0.02525
Constant	3.70921	0.04227
LNCBR	0.61405	0.00002
LNPCA	-0.23848	0.01952
LNMWV	-0.24342	0.01217
LNLIT	2.28596	0.04186
R-squared :	0.83264	

Figure 6. Significance Map of SAR Model



Finally, as an interesting result it is seen that there is a positive relationship between the literacy rate (LIT) in the provinces and the infant mortality rate. Although a logically inverse relationship is expected in this case, it should be noted that the research uses spatial econometric techniques and that comments should be made using the provinces listed in Table 1. The dependent variable, as explained in the induction section, shows the death rate per thousand live births in a year. In this context, it is worth noting that the literate individual ratio has an indirect effect on the dependent variable, rather than a direct effect. When the relationship of all variables with the dependent variable is analyzed through the map, the following relationship is obtained between the provinces.

4. CONCLUSION

The importance of health indicators, the high number of deaths, and the fact that infant and child deaths may be prevented through low-cost interventions to improve infant/child health and eradicate infant mortality have raised it to one of the most important development summit issues. Significant advancements have been accomplished throughout the years in parallel with changes in our country's health indicators on a global scale.

The causes affecting infant mortality in Turkey were analyzed at the NUTS-3 level in this study, the type of spatial effect in the data set was attempted to be determined, and a spatial model suitable for this effect was proposed. When the final model findings were reviewed, it was observed that the spatial regression parameter, ρ, was significant and positive. This indicates that the infant mortality rate for each location is influenced by both the model's variables and the infant mortality rate in neighbouring locations. To put it another way, when a location has a high or low infant mortality rate, the infant mortality rate in neighbouring regions is also high or low. The variables found in the final model are compatible with the studies in the literature.

The most authentic conclusion that can be drawn from this study in terms of technique is related to the way health-related parameters are handled. When the literature is examined, it is seen that when these parameters are considered with panel data models or spatial panel models, they are also associated with socio-economic variables. When the same variables are considered with cross-sectional data models, they show a stricter attitude about dating related to health-related variables. This is related to the development of socioeconomic factors and the requirement for these parameters to have an effect on health-related variables throughout time.

When the findings are evaluated, policymakers should pay close attention to the number of staff participating in the delivery of health services and maintain the ideal amount of personnel with field-specific skills for the society in order to reduce infant mortality and increase health development. Furthermore, the content and purpose of primary health care should be presented to all segments of society, as well as the critical nature of receiving these services, particularly in terms of pregnant health. Pre-pregnancy counselling within primary health care services contributes significantly to the advancement of public health by increasing fertility awareness and pregnancy planning culture, preparing parents for a healthy pregnancy, early detection and treatment, and protecting maternal and fatal health. Similarly, decreasing the crude birth rate as a result of health-conscious individuals will directly result in a decrease in infant mortality, which will lead to an improvement in a variety of health-related development indicators.

REFERENCES

AKMAN, E. & TARIM, M. (2020). Turkey and England Health Systems: Comparison of Primary Health Care. *International Journal of Health Management and Strategies Research*. 6(2), 303-316.

ALOGLU, N. & TASLIYAN, M. (2016). Evaluation of Family Health Centers' Employees in the Past (Health Centers) and the Present System (Family Doctor): A Field Study in Kahramanmaras. *International Journal of Health Management and Strategies Research*. 2(3), 1-14.

ANSELIN, L. (1988a). *Spatial Econometrics: Methods and Mod-*

els. Kluwer Academic Publishers, Dordrecht, The Netherlands.

ANSELIN, L. (1988b). Lagrange Multiplier Test Diagnostics for Spatial Dependence and Spatial Heterogeneity. *Geographical Analysis*. 20(1), 1-17.

ANSELIN, L., GALLO, J.L. & JAYET, H. (2008) *Spatial Panel Econometrics. The Econometrics of Panel Data. Advanced Studies in Theoretical and Applied Econometrics*, In: Mátyás L., Sevestre P. (eds), Vol. 46. Springer, Berlin, Heidelberg. 625-660.

BARLAS, E., SANTAS, F. & KAR, A. (2014). Comparative Analysis of the Inter-Regional Infant Mortality Rate from the Perspective of Health Economics in Turkey.*International Conference on Eurasian Economies*, 2014 July 1-3; Skopje, Macedonia, 1-10. https://www.avekon.org/papers/959.pdf

BASU, A. & MULLAHY, J. (2014). Health Econometrics: Overview.*Encyclopedia of Health Economics*. 1, 355-356.

DEMIRTAS, Z. & METINTAS, S. (2017). Evaluation of Mother and Child Health Indicators in terms of Economic and Fertility Charecteristics in Turkish Republics, *ESTUDAM Public Health Journal.* 2(1),17-25.

DER H.H. & YESILYURT M. E. (2020). *Socio-Economic Determinants of Infant Mortality Rates.* Thesis (Ms), Pamukkale University.

ELHORST, J.P. (2010). Applied Spatial Econometrics: Raising the Bar.*Spatial Econometrics Analysis.* 5(1), 9-28.

ELHORST, J.P. (2014). Linear Spatial Dependence Models for Cross-Section Data, Spatial Econometrics (Chapter2). *Springer-Berlin Heidelberg.* 5-36.

FISCHER, M.M. & WANG, J. (2011). Spatial Data Analysis: Models, Methods And Techniques. *Springer Science & Business Media.*

FREXEDAS, O.V. & VAYA, E. (2005). Financial Contagion Between Economies: An Exploratory Spatial Analysis. *Estudios De Economia Aplicada.* 23(1), 151-165.

FLORAX, R.J. & VAN DER VLIST, A.J. (2003). Spatial Econometric Data Analysis: Moving Beyond Traditional Models. *International Regional Science Review.* 26(3), 223-243.

GETIS, A. & ORD, J.K. (1992). An Analysis of Spatial Association by use of Distance Statistic, *Geographical Analysis.* 24(3), 189-206.

GIBBONS, S. & OVERMAN, H.G. (2012). Mostly Pointless Spatial Econometrics, *Journal of Regional Science.* 52(2), 172-191.

GIDER, O. & GUZEL, I. (2018). Evaluation of Selected Health Indicators of Turkey and Other European Union Candidate Countries.*2nd International 12th National Congress on Health and Hospital Administration*. 2018 Oct 11-13, Muğla, Turkey, 1658-1664.

GUMPRECHT, D. (2007). *Spatial Method in Econometrics*. Doctoral Dissertation, WU Vienna University of Economics and Business.

HAMZAOGLU, O. (2017). Hidden Mortality Among The Infants and the Regional Inequalities In Turkey.*Community and Physician | A Journal of Turkish Medical Association.* 32(4), 288-294.

HORDIJK, L. & NIJKAMP, P. (1977). Dynamic Models of Spatial Autocorrelation. *Environment and Planning A.* 9(5), 505-519.

KALANLAR, B. (2018). Health Sector in Turkey's Centenary, Current Situation and Prospects, *Hacettepe Journal of Health Administration.* 21(3), 495-510.

KURT, A.K., SET, T. & ATES, E. (2019). The Relationship Between Primary Health Care Services and Pregnancy Diagnosis and Follow-Up, *Eurasian Journal of Family Medicine.* 8(4), 175-181.

MANAVGAT, G. & CELIK, N. (2017). A Spatial Analysis for the Determinants of Health Status: The Case of Turkey NUTS-3.*Sosyoekonomi.* 25(34), 53-67.

MOSCONE, F. & TOSETTI, E. (2014). Spatial Econometrics: Theory and Applications in Health Economics.*Encyclopedia of Health Economics.* 3, 329-334.

REPUBLIC OF TURKEY MINISTRY OF HEALTH. (2019). Annal of Health Statistics [online]. Turkey, https://sbsgm.saglik.gov.tr/Eklenti/40564/0/saglik-istatistikleri-yilligi-2019pdf.pdf , [Date Accessed: 26/05/ 2021.]

THE INTERNATIONAL CONFEDERATION OF MIDWIVES. (2017). International Definition of the Midwife [online]. The Hague, The Netherlands, https://www.internationalmidwives.org/assets/files/definitions-files/2018/06/eng-definition_of_the_midwife-2017.pdf , [Date Accessed: 14/08/ 2021].

TURKISH STATISTICAL INSTITUTE. (2019). Province Indicators [online]. Turkey, https://biruni.tuik.gov.tr/ilgosterge/?locale=tr, [Date Accessed: 26/05/ 2021].

TURKISH STATISTICAL INSTITUTE. (2019). Death and Cause of Death Statistics [online]. Turkey, https://data.tuik.gov.tr/Bulten/Index?p=Olum-ve-Olum-Nedeni-Istatistikleri-2019-33710#:~:text=Bebek%20%C3%B61%C3%BCm%20h%C4%B1z%C4%B1%20binde%209,y%C4%B1l%C4%B1nda%20binde%209%2C1%20oldu., [Date Accessed: 02/08/ 2021].

TURKISH STATISTICAL INSTITUTE. (2020). Birth Statistics [online]. Turkey, https://data.tuik.gov.tr/Bulten/Index?p=Birth-Statistics-2020-37229, [Date Accessed: 02/08/ 2021].

VITON, P.A. (2010). Notes on Spatial Econometric Models, *City and Regional Planning*. [online]. https://www.yumpu.com/en/document/view/3858779/notes-on-spatial-econometric-models-the-ohio-state-university, [Date Accessed: 01/09/ 2021].

WANG, S. & WU, J. (2020). Spatial Heterogeneity of the Associations of Economic and Health Care Factors with Infant Mortality in China Using Geographically Weighted Regression and Spatial Clustering, *Social Science & Medicine.* 263, 1-9.

YANKEY, O., AMEGBOR, P.M. & LEE, J. (2021). The Effect of Sociodemographic Factors on the Risk of Poor Mental Health in Akron (Ohio): A Bayesian Hierarchical Spatial Analysis, *Spatial and Spatio-temporal Epidemiology.* 38, 100438.

YETIM, B., DEMIRCI, S., KONCA, M., ILGUN, G. & CILHOROZ, Y. (2021). Socio-Economic Determinants of Infant Mortality Rate in Turkey. *Sosyoekonomi.* 29(47), 367-381.